

In re Application of Verma et al.  
Serial No. 10/611,683

**Listing of the Claims:**

1. (original) In a computing environment, a system comprising:  
a logical volume of a file system; and  
a plurality of resource managers maintained on the file system volume, each resource manager independent from one another and having associated transactional metadata and a collection of associated files.
2. (original) The system of claim 1 wherein at least one resource manager comprises properties that differ from properties of another resource manager.
3. (original) The system of claim 1 wherein at least one resource manager comprises transactional file system metadata that differ from transactional file system metadata of another resource manager.
4. (original) The system of claim 1 wherein one of the resource managers contains files associated with a first database, and wherein another of the resource managers contains files associated with a second database.
5. (original) The system of claim 1 wherein the file system maintains a volume control data structure associated with a set containing at least one resource manager control data structure.

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6. (original) The system of claim 1 further comprising a mechanism in the file system for discovering a resource manager control data structure associated with a file data structure.

7. (original) The system of claim 1 wherein the file system maintains a first data structure having data identifying at least one resource manager control data structure.

8. (original) The system of claim 7 wherein each file in the collection includes a reference to data maintained in the first data structure to identify a resource manager control data structure for that file.

9. (original) The system of claim 1 further comprising an open file object on the volume, wherein the file system maintains a file control data structure corresponding to the open file object, the file control data structure including a reference to a resource manager control data structure that corresponds to a resource manager to which the file is associated.

10. (original) The system of claim 9 wherein the file control data structure includes data that indicates that the open file object comprises the resource manager.

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11. (original) The system of claim 9 wherein the data is persisted in a record in a file system table, the record corresponding to the file.

12. (original) The system of claim 1 wherein the file system includes a set of functions for interfacing with the resource manager.

13. (original) The system of claim 12 wherein one function creates a new resource manager.

14. (original) The system of claim 12 wherein one function starts a resource manager.

15. (original) The system of claim 1 wherein each resource manager corresponds to a directory hierarchy, and wherein the collection of associated files comprises files logically under that directory hierarchy.

16. (original) The system of claim 1 wherein associated transactional metadata includes a log file.

17. (original) In a computing environment, a method comprising:  
separating a volume into a plurality of resource managers, each resource manager associated with transaction metadata;

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receiving a request to open a file system object associated with a resource manager;

creating a file control block for the file system object;

determining whether the file control block references a resource manager control block, and if not, discovering a resource manager control block corresponding to the file system object and associating the file control block with the discovered resource manager control block.

18. (original) The method of claim 17 wherein discovering the resource manager control block includes creating a resource manager control block.

19. (original) The method of claim 17 wherein associating the file control block with the discovered resource manager control block comprises writing a pointer into the file control block that points to the resource manager control block.

20. (original) The method of claim 17 wherein discovering the resource manager control block includes determining whether the resource manager control block exists, and if not, creating the resource manager control block, and modifying the file control block to include an association with the resource manager control block.

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21. (original) The method of claim 17 wherein discovering the resource manager control block includes locating a file control block of a parent file that is associated with the resource manager control block.

22. (original) The method of claim 17 wherein discovering the resource manager control block includes locating a reference to a table location containing resource manager control block data, and using the reference to obtain a pointer to the resource manager control block.

23. (original) The method of claim 22 wherein locating the reference to the table location comprises reading a header of the file object.

24. (original) The method of claim 22 further comprising maintaining a table including the table location in a volume control block.

25. (original) The method of claim 17 wherein each resource manager corresponds to a subdirectory in the file system, and wherein the file system object is logically associated with the subdirectory.

26. (original) The method of claim 17 wherein at least one resource manager is associated with a database, and further comprising, performing a transaction that includes at least one operation by the database and at least one operation by the file system.

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27. (original) A computer-readable medium having computer-executable instructions for performing the method of claim 17.

28. (original) In a computing environment, a system comprising:  
means for separating a volume into a plurality of units of management, each unit of management associated with transaction metadata; and  
database means having data maintained in a table and data maintained in a first unit of management on the file system, the first unit of management having at least one property that is different relative to a property on a second unit of management.

29. (original) The system of claim 28 wherein the transaction metadata of the first unit of management contains a log, and wherein at least one property of the first unit of management corresponds to a size of the log.

30. (canceled) – *both instances*.

31. (original) The system of claim 28 further comprising, means for creating a unit of management.

32. (original) The system of claim 28 further comprising, means for starting a unit of management.

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33. (original) The system of claim 28 further comprising, means for shutting down a unit of management.

34. (original) In a computing environment, a method comprising:  
separating a file system volume into a plurality of parts;  
associating at least one of the parts with a first resource manager and at least one other of the parts with a second resource manager; and  
providing transactional services via each resource manager.

35. (original) The method of claim 34 wherein separating a file system volume into a plurality of parts comprises collecting a plurality of sets of files.

36. (original) The method of claim 35 wherein associating at least one of the parts with a first resource manager comprises associating a first set of files with the first resource manager.

37. (original) The method of claim 36 wherein the first resource manager corresponds to a subdirectory on the file system volume, and wherein associating the first set of files with the first resource manager comprises logically storing the first set of files in the directory hierarchy rooted at the subdirectory.

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38. (original) The method of claim 37 further comprising a security model for the files of the first resource manager, in which the files within the first resource manager are at most as secure as an object representing the first resource manager.

39. (original) The method of claim 38 wherein the security model prevents setting an ACL to represent a greater degree of access control relative to a degree of access control of the object.

40. (original) The method of claim 34 wherein the first resource manager provides transactional services to a database.

41. (original) The method of claim 40 wherein the database maintains a reference to at least one file associated with the first resource manager.

42. (original) The method of claim 34 wherein associating at least one of the parts with the first resource manager comprises associating a file with the first resource manager, the file having information therein that indicates the association.

43. (original) The method of claim 34 wherein separating a file system volume into a plurality of parts comprises collecting a plurality of sets of files, and wherein associating at least one of the parts with a first resource manager comprises associating files of a common type with the first resource manager.



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44. (original) A computer-readable medium having computer-executable instructions for performing the method of claim 34.

45. (currently amended) In a computing environment, a method comprising:

separating a file system volume into a plurality of transactional resource managers that provide transactional services; and

performing a function with respect to a selected resource manager, the resource managers being independent of one another such that the function is performed independently of any other resource manager.

46. (original) The method of claim 45 further comprising, receiving a request to perform the function.

47. (original) The method of claim 46 wherein receiving the request comprises receiving an application programming interface call.

48. (original) The method of claim 45 wherein the function corresponds to a backup operation of at least some of the files of a resource manager.

49. (original) The method of claim 45 wherein the function corresponds to a restore operation of at least some of the files of a resource manager.

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50. (original) The method of claim 45 wherein the function corresponds to a roll forward to a point in time operation.

51. (original) The method of claim 45 wherein the function corresponds to a crash recovery operation.

52. (original) The method of claim 45 wherein the function corresponds to a redo phase of a recovery operation.

53. (original) The method of claim 52 further comprising, performing the function at least one other time.

54. (original) The method of claim 45 wherein the function corresponds to an undo phase of a recovery operation.

55. (original) A computer-readable medium having computer-executable instructions for performing the method of claim 45.

56. (new) The system of claim 28 wherein the transaction metadata of the first unit of management contains a log, and wherein at least one property of the first unit of management corresponds to a mode of logging data to the log.

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57. (new) The system of claim 28 wherein at least one property of the first unit of management corresponds to a log size